

## REMARKS

Claims 1-4, 6-9, 11, 15, 30-41, and 43-62 are currently pending. Claims 6, 9, 43, and 52 have been cancelled. Claims 1, 3, 37, 38, 41, and 60 have been amended. New claim 63 has been added. Attached hereto as Appendix A is a marked-up version of the changes made to the claims and specification by the current amendment entitled "Version with markings to show changes made." Attached hereto as Appendix B is a clean copy of the pending claims after entry of the present amendment entitled "Pending Claims After Entry of Amendment and Reply to Office Action Mailed March 5, 2001."

The claims have been amended to obviate the rejections under 35 U.S.C. § 112, first second paragraph. Specifically, Claims 1 and 41 have been amended to provide quantification of to what extent the release rate is reduced. Support for this amendment is found, *inter alia*, in Table 1 on page 23 of the specification. Claim 1 has been amended to remove reference to the forming zone. Claim 41 has been amended to remove reference to the encapsulation process and to instead recite a "combining" step. Support for this amendment is found, *inter alia*, in the original claims as filed.

Applicants respectfully traverse the requirement that the pre-polymer be claimed. Support for combining the pesticide-containing carrier particles and the polymer is found in the original claims as filed and in particular in original claims 1 and 3, and the specification has been amended to incorporate the language in the original claims directed to combining the pesticide carrier mix with a polymer. For the Examiner's convenience, a copy of the original claims as filed is being attached hereto as Appendix C.

The claims have also been amended to obviate the rejections under 35 U.S.C. § 112, second paragraph. Specifically, claims 3, 37, and 38 have been amended to substitute the term "hydrophilic lipophilic balance" for its synonymous abbreviation "HLB." Claim 60 has been amended to include the generic identification of the terms "Mylar" and "saran". As claims 3, 37, 38, and 60 have been amended to include equivalent terms, no new matter has been added by way of these amendments.

As claims 9, 43, and 52 has been cancelled, the rejection of these claims under 35 U.S.C. § 112, first and/or second paragraph is deemed to be moot.

In view of the above amendments and comments, it is believed that the rejections under 35 U.S.C. § 112, first and second paragraphs have been obviated. Withdrawal of the rejection of the claims under 35 U.S.C. § 112 is respectfully requested.

Before addressing the specific rejections based on the prior art, Applicants believe it may be beneficial to briefly address the claimed invention. The claimed invention is based on the discovery of a method for producing a controlled release matrix which dispenses pesticide so as to retard or prevent the decay or deterioration of wooden objects by pests for a prolonged period of time. The approach of the present invention is to make a device for the controlled release of at least one pesticide by (a) forming a mixture comprising at least one liquid pesticide, a plurality of carrier particles, and a hydrophobic thermoplastic polymer to bind the pesticide to the carrier particles such that the release rate of the pesticide from the controlled release matrix is reduced to a particular release rate and (b) forming the pesticide-containing carrier particles and the polymer into a controlled release matrix having pesticide-containing carrier particles dispersed throughout the polymer. In accordance with another approach of the present invention, a device for the controlled release of at least one pesticide is made by (a) binding at least one liquid pesticide to carrier particles to produce pesticide-containing carrier particles and (b) combining the pesticide-containing carrier particles and a polymer to produce a controlled release device such that a particular release rate of the pesticide is achieved.

The invention as presently claimed is patentable over the references applied by the Examiner. None of the references alone or in combination disclose binding at least one liquid pesticide to carrier particles to achieve the claimed release rate of the pesticide from the matrix, forming pesticide-containing carrier particles and polymer into a controlled release matrix having pesticide-containing carrier particles dispersed throughout the polymer, or combining pesticide-containing carrier particles with a polymer to form a controlled release matrix or device having the claimed release rate as presently claimed.

U.S. Patent No. 5,139,566 ("Zimmerman") is directed to a geotextile that is "applied to the soil to form a layer on or beneath the soil." Col. 3, ll. 44-45. The geotextile is a "porous web" having a "plurality of spaced nodules" of a "slow release, soil treatment system bonded thereto." Col. 2, l. 67 - Col. 3, l. 5. The nodules comprise the "soil treatment agent which is dispersed in a water insoluble solid binder or matrix." Col. 3, ll. 27-31. Suitable binders or carriers for soil treatment agents include thermoplastic materials. Col. 3, ll. 36-37. The binder is preferably a thermoplastic polymer and the preferred carrier is preferably

polyethylene. Col. 3, ll. 37-42. Where a carrier is used, the carrier may contain fillers or absorbent materials. Col. 3, ll. 42-43. The geotextile is made by "injecting or forcing . . . a mixture of liquid binder and active agent through one side of the porous web." Col. 3, ll. 57-62. During solidification, the "porous web is entrapped by the binder" so that the "nodule is permanently enmeshed and attracted to the web." Col. 3, ll. 63-65.

The approach in Zimmerman differs from that of the claimed invention. Zimmerman is directed to treating soil via a web having nodules containing soil treatment agents dispersed in a binder (*i.e.*, a thermoplastic material). In contrast, the claimed invention is directed to a controlled release matrix or device which retards or prevents decay or deterioration of a wooden object by pests by forming pesticide-containing carrier particles to reduce the release rate of the pesticide. Nowhere in Zimmerman is there disclosed the steps of binding a pesticide to carrier particles to form pesticide-containing carrier particles, combining pesticide-containing carrier particles with a polymer, or dispersing the pesticide-containing carrier particles throughout the polymer as presently claimed.

U.S. Patent No. 4,343,790 ("Pasarela") is directed to pesticidal compounds that comprise "granular carriers impregnated or coated with a phosphorous containing pesticide . . . and further coated with an acrylic polymer." Abstract, ll. 1-11. The approach in Pasarela differs from that of the claimed invention. While Pasarela teaches a pesticidal composition prepared by impregnating a toxicant with a granular carrier and coating the impregnated granular formulation with a polymer, the claimed invention is directed to a controlled release matrix having pesticide bound to the carrier particles to reduce the release rate of the pesticide from the matrix. Nowhere in Pasarela is there disclosed a controlled release matrix having pesticide-containing carrier particles mixed with a polymer or dispersed within a polymer as claimed in the present application.

U.S. Patent No. 5,650,163 ("Cannelongo") likewise is directed to a concept different from that presently claimed. Cannelongo is directed to "safened pesticidal resin compositions for controlling soil borne pests and process for the preparation thereof." Col. 3, ll. 60-62. The compositions may be prepared as concentrates by dry blending a pesticide and a polyvinylic resin. Col. 4, ll. 4-11. Alternatively, the compositions may be prepared as finished compositions by dry blending a mixture of resin, mineral additive, stabilizer, and lubricant and admixing the mixture with a pesticide, secondary plasticizing agent, and stabilizing agent. Col. 4, ll. 4-41. Nowhere in Cannelongo is there disclosed the steps of binding a pesticide to carrier particles to form pesticide-containing carrier particles, combining pesticide-containing

carrier particles with a polymer, or dispersing the pesticide-containing carrier particles throughout the polymer as presently claimed.

The addition of U.S. Patent No. 4,344,250 ("Fahlstrom"), U.S. Patent No. 4,971,796 ("Sjogren"), and Chemical Level to the Pasarela/Cannelongo combination fails to render the claimed invention obvious under 35 U.S.C. § 103(a).

Fahlstrom is directed to a concept which differs from what is presently claimed. Fahlstrom is directed to "an improved method for the internal treatment of a wood structure." Col. 1, l. 66 - Col. 2, l. 3. The method uses a hollow container "made out of a material which is resistant to chemical degradation or solubilization by the chemical components enclosed, while at least one closure means . . . is fabricated out of a material which undergoes an interaction with one or more the in enclosed components or in the vapors of one or more components of the treatment agent." Col. 3, ll. 28-35. Fahlstrom fails to disclose the binding of a pesticide to carrier particles to form pesticide-containing carrier particles, combining of pesticide-containing carrier particles with a polymer, or dispersing pesticide-containing carrier particles throughout the polymer as presently claimed.

The Sjogren patent is also directed to a concept which differs from what is presently claimed. Sjogren is directed to a "controlled slow release pesticide composition comprising an active or inert core, a pesticide, at least one collagen protein compositional layers, and when more than one protein layer is used, an intervening separation layer between the protein layers." Col. 3, ll. 28-33. Nowhere in Sjogren is there disclosed a controlled release matrix or device made by binding a pesticide to carrier particles to form pesticide-containing carrier particles, combining pesticide-containing carrier particles with a polymer, or dispersing pesticide-containing carrier particles throughout a polymer as presently claimed.

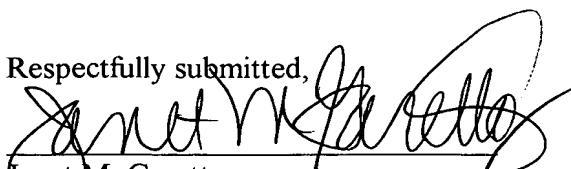
In addition, Chemical Level does not disclose a controlled release matrix or device made by binding a pesticide to carrier particles to form pesticide-containing carrier particles, combining pesticide-containing carrier particles with a polymer, or dispersing pesticide-containing carrier particles throughout a polymer as presently claimed.

As none of the references applied by the Examiner teaches or discloses the approach as presently claimed, withdrawal of the rejection of the claims under 35 U.S.C. § 102(b) and 103(a) is respectfully requested.

The Commissioner is hereby authorized to charge any additional fees which may be required (except for the issue fee) or credit any overpayment to Deposit Account No. 10-0447 (Order No. 47309-00025USC1).

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VERSION WITH MARKINGS TO SHOW CHANGES MADEIn the specification:

The paragraph beginning at line 1 of page 2 has been amended as follows:

When a carrier is added, it has been found that simply adding the carrier to a mix of pesticide and pre-polymer results in poor formability of the controlled release device and permits evaporation of the pesticide. Accordingly, it is preferred to first mix the pesticide into the carrier so that the pesticide is preferably bound either onto the surface of the carrier or into the bulk volume of the carrier or both. The mix of pesticide and carrier is then combined with a polymer. The mix of pesticide and carrier may be combined with a pre-polymer. [The mix of pesticide and carrier is then added to a pre-polymer.] The bound pesticide is retarded or prevented from evaporation during subsequent forming of the polymer. The pesticide is best mixed with carrier with the pesticide in a liquid form. Some pesticides are in liquid form at room temperature, and others are solid or near solid at room temperature. Accordingly, heating the pesticide may be necessary to insure a liquid form for mixing with the carrier. For the pesticide in solid form with a high melting temperature, for example the fungicide carbendazin, the solid form is preferably a powder or granular form mixed with the carrier. The pesticide may be in the form of a paste and mixed with a carrier.

In the claims:

Claims 6, 9, 43 and 52 have been cancelled.

Claims 1, 3, 37, 38, 41 and 60 have been amended.

1. (Four Times Amended) A method of making a matrix for controlled release of at least one pesticide useful for retarding or preventing decay or deterioration of a wooden object by pests, the method comprising the steps of:

(a) forming a mixture comprising at least one liquid pesticide, [and] a plurality of carrier particles, and a hydrophobic thermoplastic polymer to bind a sufficient

amount of the pesticide to the carrier particles so as to reduce the release rate of the pesticide from the controlled release matrix to the range from 0.4 µg/cm<sup>2</sup>/day to 40.4 µg/cm<sup>2</sup>/day;

[(b) placing the pesticide-containing carrier particles and a hydrophobic thermoplastic polymer in a forming zone;] and

(b) [(c)] forming the pesticide-containing carrier particles and the polymer [placed in said zone] into a controlled release matrix having pesticide-containing carrier particles dispersed throughout the polymer.

3. (Three Times Amended) The method as recited in claim 1, wherein said hydrophobic polymer has a hydrophobicity of less than about 13 on either the hydrophilic lipophilic balance [HLB] or solubility parameter scale.

37. (Twice Amended) The method of claim 1 wherein said hydrophobic polymer has a hydrophobicity of less than about 10 on either the hydrophilic lipophilic balance [HLB] or solubility parameter scale.

38. (Twice Amended) The method of claim 1 wherein said hydrophobic polymer has a hydrophobicity of less than about 8 on either the hydrophilic lipophilic balance [HLB] or solubility parameter scale.

41. (Twice Amended) A method of making a device for controlled release of at least one pesticide useful for retarding or preventing decay or deterioration of a wooden object by pests, said method comprising the steps of:

(a) binding at least one liquid pesticide to carrier particles to produce pesticide-containing carrier particles; then

(b) combining [encapsulating] said pesticide-containing carrier particles with a thermoplastic hydrophobic polymer to produce said device, wherein the amount of pesticide bound to the carrier particles is sufficient so as achieve a [desired] release rate of the pesticide from said [device] matrix in the range from 0.4 µg/cm<sup>2</sup>/day to 40.4 µg/cm<sup>2</sup>/day.

60. (Amended) The method claimed in claim 59, wherein the at least one additional layer is selected from the group consisting of polyethylene terephthalate [Mylar], polyvinylidene chloride [saran], and combinations thereof.

New claim 63 has been added.

63. (New) The method as recited in claim 41, wherein the polymer is selected from the group consisting of low density polyethylene, high density polyethylene, vinyl acetate, urethane, polyester, silicone, neoprene, isoprene and combinations thereof.

**Pending Claims After Entry of Amendment and**  
**Reply to Office Action Mailed March 5, 2001**

1. A method of making a matrix for controlled release of at least one pesticide useful for retarding or preventing decay or deterioration of a wooden object by pests, the method comprising the steps of:

(a) forming a mixture comprising at least one liquid pesticide, a plurality of carrier particles, and a hydrophobic thermoplastic polymer to bind a sufficient amount of the pesticide to the carrier particles so as to reduce the release rate of the pesticide from the controlled release matrix to the range from 0.4  $\mu\text{g}/\text{cm}^2/\text{day}$  to 40.4  $\mu\text{g}/\text{cm}^2/\text{day}$ ; and

(b) forming the pesticide-containing carrier particles and the polymer into a controlled release matrix having pesticide-containing carrier particles dispersed throughout the polymer.

2. The method as recited in claim 1, wherein the at least one pesticide is in a solid form, said method further comprising the step of heating at the least one solid pesticide to convert it into liquid form prior to said binding step.

3. The method as recited in claim 1, wherein said hydrophobic polymer has a hydrophobicity of less than about 13 on either the hydrophilic lipophilic balance or solubility parameter scale.

4. The method as recited in claim 1, wherein said forming comprises enveloping said mixture as an inner part within a second hydrophobic polymer.

7. The method as recited in claim 1, wherein said hydrophobic thermoplastic polymer is selected from the group consisting of low density polyethylene, high density polyethylene, vinyl acetate, polyester, silicone, neoprene, isoprene and combinations thereof.



8. The method as recited in claim 1, wherein at least one said pesticide has a vapor pressure in the range from 1 nPa to 100 mPa.

11. The method as recited in claim 1, wherein said pesticide is water soluble.

15. The method as recited in claim 1, wherein said pesticide is selected from the group consisting of biphenyl, dichlorophen, tri-chloronitromethane, and combinations thereof.

30. The method claimed in claim 1 wherein the forming step is performed by injection molding.

31. The method claimed in claim 1 wherein the at least one pesticide is a fungicide.

32. The method claimed in claim 31 wherein the at least one pesticide further includes a pesticide for eliminating wood boring insects.

33. The method claimed in claim 1 wherein the matrix is formed into a pellet.

34. The method claimed in claim 1 wherein the matrix is formed into a sheet.

35. The method claimed in claim 1 wherein the matrix is formed into strips.

36. The method claimed in claim 1 wherein said carrier comprises from about 3 to about 30 weight percent of said matrix and said polymer comprises from about 40 weight percent to about 92 weight percent of said matrix.



37. The method of claim 1 wherein said hydrophobic polymer has a hydrophobicity of less than about 10 on either the hydrophilic lipophilic balance or solubility parameter scale.

38. The method of claim 1 wherein said hydrophobic polymer has a hydrophobicity of less than about 8 on either the hydrophilic lipophilic balance or solubility parameter scale.

39. The method of claim 1 wherein the carrier is carbon black.

40. The method of claim 1 wherein the carrier is hydroxyapatite.

41. A method of making a device for controlled release of at least one pesticide useful for retarding or preventing decay or deterioration of a wooden object by pests, said method comprising the steps of:

(a) binding at least one liquid pesticide to carrier particles to produce pesticide-containing carrier particles; then

(b) encapsulating said pesticide-containing carrier particles with a thermoplastic hydrophobic polymer to produce said device, wherein the amount of pesticide bound to the carrier particles is sufficient to achieve a release rate of the pesticide from said matrix in the range from 0.4  $\mu\text{g}/\text{cm}^2/\text{day}$  to 40.4  $\mu\text{g}/\text{cm}^2/\text{day}$ .

44. The method of claim 1, wherein the release rate of the pesticide from the controlled release matrix is reduced so as to retard or prevent decay or deterioration of the wooden object by pests for a period of at least about 7 years.

45. The method as recited in claim 1, wherein the polymer is low density polyethylene.

46. The method as recited in claim 1, wherein the at least one pesticide is an insecticide.



47. The method as recited in claim 1, wherein the pesticide is selected from the group consisting of pyrethrin, tefluthrin, permethrin, cypermethrin, fenoxy carb, chlorpyrifos, lambda cyhalothrin, resmethrin, deltamethrin, cyphenothrin, cyfluthrin, and combinations thereof.

48. The method claimed in claim 1, wherein the pesticide is lambda cyhalothrin.

49. The method claimed in claim 1, further comprising the step of shaping the mixture of the pesticide-containing carrier particles and the polymer into a multi-laminate sheet.

50. The method claimed in claim 34, wherein the sheet has a thickness in the range from about 60 mil to about 120 mil.

51. The method claimed in claim 1, wherein said at least one pesticide comprises from about 5 to about 30 weight percent of the matrix.

53. The method as recited in claim 41, wherein the polymer is low density polyethylene.

54. The method as recited in claim 41, wherein the at least one pesticide is an insecticide.

55. The method as recited in claim 41, wherein the pesticide is selected from the group consisting of pyrethrin, tefluthrin, permethrin, cypermethrin, fenoxy carb, chlorpyrifos, lambda cyhalothrin, resmethrin, deltamethrin, cyphenothrin, cyfluthrin, and combinations thereof.

56. The method as recited in claim 41, wherein the pesticide is lambdacyhalothrin.

57. The method as recited in claim 41, wherein the release rate of the pesticide from the matrix is between about 0.7  $\mu\text{g}/\text{cm}^2/\text{day}$  to about 20.6  $\mu\text{g}/\text{cm}^2/\text{day}$ .

58. The method as recited in claim 41, wherein the device is in the form of a rod, sheet, sleeve, strip, or pellet.

59. The method claimed in claim 41, further comprising the step of shaping the device into a sheet having at least one additional layer.

60. The method claimed in claim 59, wherein the at least one additional layer is selected from the group consisting of polyethylene terephthalate, polyvinylidene chloride, and combinations thereof.

61. The method claimed in claim 41, further comprising the step of shaping the device into a multi-laminate sheet.

62. The method claimed in claim 41 further comprising the step of shaping the device into a pellet.

63. The method as recited in claim 41, wherein the polymer is selected from the group consisting of low density polyethylene, high density polyethylene, vinyl acetate, urethane, polyester, silicone, neoprene, isoprene and combinations thereof.

## CLAIMS

We claim:

*selected from consisting of  
the group carbon black and  
hydroxy styrene*

1. A method of making a controlled release device useful for retarding or preventing decay or deterioration of a wooden object from a pest, the method having the steps of:
  - (a) mixing a pesticide including at least one fungicide, with a carrier wherein the pesticide is bound to the carrier in a pesticide carrier mix, then
  - (b) combining the pesticide carrier mix with a polymer.
2. The method as recited in claim 1, wherein the pesticide is in a liquid form.
3. The method as recited in claim 1, wherein said combining is by mixing the pesticide carrier mix with a pre-polymer thereby forming said hydrophobic polymer upon polymerization or curing.
4. The method as recited in claim 1, wherein said combining is by encasing said pesticide carrier as an inner part with an outer part of said hydrophobic polymer.
5. The method as recited in claim 1, wherein said polymer is a hydrophobic polymer.
6. The method as recited in claim 5, wherein said hydrophobic polymer is selected from the group consisting of thermoplastic polymers, thermoset polymers, elastomeric polymer and copolymers thereof.

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7. The method as recited in claim 5, wherein said hydrophobic polymer is selected from the group consisting of low density polyethylene, high density polyethylene vinyl acetate, urethane, polyester, silicone, neoprene, disoprene 5 and combinations thereof.

8. The method as recited in claim 1, wherein said pesticide has a low vapor pressure.

9. The method as recited in claim 8, wherein said low vapor pressure pesticide is combined with a high density 10 pre-polymer.

10. The method as recited in claim 9, wherein said high density pre-polymer is selected from the group consisting of high density polyethylene.

11. The method as recited in claim 1, wherein said 15 pesticide is water soluble.

12. The method as recited in claim 11, wherein said pesticide is combined with a low density pre-polymer.

13. The method as recited in claim 12, wherein said 20 low density pre-polymer is selected from the group consisting of urethane, polyester, low density polyethylene, and combinations thereof.

14. The method as recited in claim 13, wherein said fungicide is selected from the group consisting of tri-chloronitromethane under the tradename Chloropicrin, a 25 mixture of methylisothiocyanate and 1-3 dichloropropane under the tradename Vorlex, sodium N-methyl dithiocarbamate

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under the tradename Vapam, 2,3,5,6 - tetracholoro - 1,9 - benzoquinone under the tradename Chloronil, calcium cyanamide, biphenyl, copper naphthenate, dichlorphen, fentin hydroxide and combinations thereof.

5        15. The method as recited in claim 1, wherein said fungicide is selected from the group consisting of byphenyl, dichlorphen, Chlorpicrin, and combinations thereof.

10        16. A method of preventing the decay and deterioration of wooden objects in contact with soil caused by the invasion of pests comprising the steps of:

- (a) mixing a pesticide including at least one fungicide, said pesticide in liquid form, with
- (b) a carrier forming a pesticide carrier mix,
- (c) combining the pesticide carrier mix with a polymer thereby forming a controlled release device, the concentration of the pesticide being sufficient to provide a predetermined release rate through said polymer and sufficient to provide a minimal effective level to prevent pest intrusion for a predetermined period of time; and

15        (b) placing the controlled release device proximate the wooden object.

20        17. The method of claim 16 wherein the controlled release device releases pesticide at an initially high rate and a lower, steady state rate thereafter.

25        18. The method of claim 16 wherein the minimal effective level is maintained throughout the whole wooden structure.

19. The method of claim 16 wherein the minimal effective level is maintained in a zone of the wooden structure.

20. The method of claim 16 where the polymer is  
5 selected from the group consisting of thermoset polymers, thermoplastic polymers, elastomeric polymers, thermoplastic polymers, elastomeric polymers, and copolymers thereof.

21. The method as recited in claim 16, wherein proximate is within said wooden object.

10 22. The method as recited in claim 16, wherein proximate is on an exterior surface of said wooden object.

23. The method as recited in claim 16, wherein proximate is touching or in physical contact with said wooden object.

15 24. A controlled release device, comprising:

(a) a pesticide including at least one fungicide bound to,

(b) a carrier, thereby defining a carrier bound pesticide,

20 (c) said carrier bound pesticide enveloped within a hydrophobic polymer.

25 25. The controlled release device as recited in claim 24, wherein enveloped is an encapsulation or surrounding of said carrier bound pesticide as an inner part with said hydrophobic polymer as an outer part.

26. The controlled release device as recited in claim 24, wherein enveloped is integration of said carrier bound pesticide within said hydrophobic polymer as the hydrophobic polymer is cross linked or cured.

5 27. The controlled release device as recited in claim 26, in the form of a rod, pellet, sleeve or sheet.

28. The controlled release device as recited in claim 27, wherein said sheet further comprises a second sheet for retarding or preventing photodegradation of said pesticide.

10 29. The controlled release device as recited in claim 28, wherein said second sheet is a polymer selected from the group consisting of metallized Mylar, saran, or combinations thereof.